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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/413,177 10/07/99 CHAN

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EXAMINER

MM91/0302

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POUGHKEEPSIE NY 12603

BROCK II, P
ART UNIT

PAPER NUMBER

2815
DATE MAILED:

03/02/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trad marks

Office Action Summary

Application No.

09/413,177

Applicant(s)

CHAN ET AL.

Examiner

Paul E Brock II

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5,6 and 8-18 is/are rejected.
- 7) ☒ Claim(s) 1-4, 7 and 13 is/are objected to.
- 8) ☐ Claims ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1 – 3 and 13 are objected to because of the following informalities:

In claim 1 “forming the structure for a first layer of cavities... forming the structure for a second layer of cavities...” is unclear due to a first and second layer of cavities not being defined. For purposes of this office action these informalities will be interpreted as “forming a structure for a first layer of cavities... forming a structure for a second layer of cavities...”

In claim 3, second to last line of the claim “that” should be “than”.

In claims 2 and 13, the use of the term “furthermore” does not add any substance to the claims and should be eliminated.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. The wherein clause in claim 5 lacks proper antecedent basis because claim 1 has no recitation of “said first and second layer of nitride” “first and second openings”, “said second layer of oxide”, and “said first layer of oxide”. There is insufficient antecedent basis for these limitations in the claim. Further, there is no single claim prior to claim 5 from which this claim could depend to cure this problem.

4. Likewise claim 6 is similar to claim 5 wherein claim 6 recites the limitations “first and second openings” and “said second layer of oxide”. There is insufficient antecedent basis for

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these limitations in the claim. Further, there is no single claim prior to claim 6 from which this claim could depend to cure this problem.

5. Regarding claim 7, the phrase "this method" renders the claim indefinite because it is unclear whether "this method" refers to every aspect of claim 1, or just a particular step of the method of claim 1.

6. Regarding claim 8, it can't be determined if "said layers of nitride are replaced by layers of a disposable solid" is a step within the method of claim 1. Furthermore, "said layers of nitride are replaced by layers of a disposable solid" appears to be an inaccurate description of the claimed invention because nothing is being replaced rather the nitride is disclosed as a disposable solid.

7. Regarding claim 9, claiming that a disposable solid layer is a polymer is an improper shift of the applicants' invention. In claim 8 it was expected that the nitride and disposable solid are one in the same. Therefore, claim 9 is indefinite because there is no antecedent basis for "said disposable solid" being a polymer.

8. Regarding claims 11 and 12, the method steps that are stated herein are directed towards removal of a polymer, therefore the limitation of claim 8 is an inaccurate description of the claimed invention.

9. With regard to claim 17, the meets and bounds of the shape of the inductor in the claim cannot be understood. It appears that the term "and" should be "or".

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1, 2, 8, 10 and 14 - 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lur et al. in view of Chu et al.

Lur et al. discloses a method of forming air gaps within an integrated circuit structure in figures 1 – 11.

With regard to claim 1, Lur et al. discloses in figure 1 providing a partially fabricated integrated circuit structure and depositing a layer of dielectric (30) thereon. Lur et al. discloses in figure 1 forming a metal layer (40) on the surface of the dielectric layer. Lur et al. discloses in figure 1 depositing a thin layer of oxide (42) over the surface of the dielectric layer thereby including the metal layer. Lur et al. discloses in figures 2 – 4 forming a structure for a first layer of cavities over the surface of the thin layer of oxide and aligned with the metal layer the first layer of cavities applying and patterning a layer of nitride (34) followed by applying and patterning a layer of oxide (42). Lur et al. discloses in figures 9 and 10 forming a structure for a second layer of cavities above and aligned with the structure for the first layer of cavities the second layer of cavities applying and patterning a layer of nitride followed by applying and patterning a layer of oxide. Lur et al. discloses in figure 11 creating the first and the second layer of cavities (85). Lur et al. discloses in figure 11 performing an oxide deposition over the surface of the second layer of cavities thereby creating a thin layer of oxide (80). Lur et al. does not disclose forming a metal inductor on the surface of the thin layer of oxide. Chu et al. teaches in figure 5 forming a metal inductor (40) on a surface of a thin layer of oxide. It would have been obvious to one of ordinary skill in the art at the time of the present invention to form the metal

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inductor of Chu et al. on the thin oxide of Lur et al. in order to form air gaps underlying an inductor as stated by Chu et al. in column 3, lines 53 – 62.

With regard to claim 2, Lur et al. discloses in figure 1 the forming a metal layer on the surface of the dielectric layer is forming a layer of metal that has the cross section of a square or a rectangle with essentially vertical sides whereby the height of the metal layer is equal to the thickness of a conventional semiconductor metal layer whereby furthermore the width of the metal layer is equal to or exceeds its height by a measurable amount.

With regard to claim 8, Lur et al. discloses that the nitride layers are a disposable solid.

With regard to claim 10, Lur et al. discloses in column 3, lines 61 – 66 removing the disposable solid layer is introducing a solvent to the substrate thereby dissolving the disposable solid layer.

With regard to claim 14, it is inherent that the partially fabricated integrated circuit structure of Lur et al. and Chu et al. contains transistors wherein the transistors are bipolar or CMOS and are interconnected to form an RF amplifier.

With regard to claims 15 and 16, Chu et al. teaches in column 3, lines 28 – 29 that the inductor is spiral shaped. It is inherent that the spiral shaped inductor of Chu et al. is either circular or polygonal shaped.

12. Claims 13, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lur et al. and Chu et al. as applied to claim 1 above, and further in view of Abidi et al.

With regard to claim 13, Lur et al. and Chu et al. do not disclose an insulating layer deposited over the surface of the inductor. Abidi et al. teaches in figures 6a – 6c depositing an insulating layer (20) over the surface of an inductor (76) thereby encapsulating the inductor. It

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would have been obvious to one of ordinary skill in the art at the time of the present invention to use the insulating layer of Abidi et al. to encapsulated the inductor of Lur et al. and Chu et al. in order to insulated the inductor from surroundings outside of the chip as is well known in the art.

With regard to claim 17, Lur et al. and Chu et al. do not disclose a polygonal shape of an inductor. Abidi et al. discloses in column 5, lines 44 – 50 a polygonal shape of an inductor is a square, a hexagon or an octagon, and since the examiner is not aware of any inductor having a shape that is a combination of a square, a hexagon and an octagon, Abidi et al. reads thereon. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the spiral square, hexagon or octagonal inductor shape of Abidi et al. in the method of Lur et al. and Chu et al. in order to have an inductor of a shape that has properties which are well known in the art.

With regard to claim 18, Lur et al. and Chu et al. do not specify properties of the inductor. Abidi et al. discloses in column 7, lines 34 – 37 an inductor which has an inductance in excess of 1nh and a self-resonance in excess of 10 MHz. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use an inductor with the disclosed properties of Abidi et al. in the method of Lur et al. and Chu et al. in order to have an RF tuned amplifier that can be fabricate having a large value monolithic inductor thereby substantially increasing as stated by Abidi et al in column 7, lines 35 – 42.

Allowable Subject Matter

13. Claims 3, 4 and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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14. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record either singularly or in combination fails to disclose at least the step of creating two openings in an oxide layer located at opposite extremities of the oxide layer which is overlying a nitride layer used for the purpose of forming cavities. The openings located at opposite extremities of the oxide layer have a diameter that is less than the dimension of the thickness of the oxide layer.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Havemann et al. and Ahn both disclose an air gap formed using a polymer as a disposable solid. Holtom et al. discloses an inductor with an air gap underneath. Thomas et al., Buynoski, Matthews and Pyke teach forming air gaps with disposable solids.

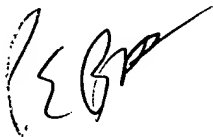
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703)308-6236. The examiner can normally be reached on 8:30 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703)308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
March 1, 2001



EDDIE C. LEE
PRIMARY EXAMINER